January 29, 2008

MEMORANDUM

TO: Jim Johnston, PE; DEQ Idaho Falls Regional Office Administrator
Greg Eager, PE; DEQ Idaho Falls Regional Office Engineering Manager

FROM: Charlie Mazzone, DEQ Idaho Falls Regional Office Water Quality Engineer

SUBJECT: Permit Renewal Staff Analysis: Arco Wastewater Treatment and Reuse Facility; LA-000029-2

1.0 Purpose

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17.400.04 *Application Processing Procedure – Contents of the Staff Analysis* for issuing wastewater reuse permits. Specifically, this staff analysis shall briefly state the principal facts and the significant questions considered in preparing the permit conditions, and a summary of the basis for the conditions with references to applicable requirements and supporting materials.

2.0 Process Description

The Arco wastewater treatment facility provides primary and secondary lagoon treatment of wastewater, wastewater storage, and wastewater disinfection. After disinfection, wastewater is land applied to 65.5 acres of the facility's 116 acres.

The wastewater treatment process incorporates four cells (lagoons): Cell A is continuously aerated, Cells B and C are facultative ponds, and Cell 4 serves as a storage pond. Wastewater influent can flow in series through Cells A, B and C, or flow parallel to Cells A and B; any of the cells can be bypassed. Typically, series flow through treatment Cells A, B and C is stored in Cell D, then rotoscreened, tablet chlorinated, then used for irrigation.

Wastewater is chlorine disinfected to 23 organisms per 100 mL (maximum) Class C effluent (IDAPA 58.01.17.600.07 et. seq.: *Specific Permit Conditions – Direct Use of Municipal Reclaimed Wastewater*) before land application.

Table 2.1 Lagoon Data

Lagoon	Description	Volume (gallons)
Cell A	Full time aerated; 4.7 acres; 6 feet deep	8,200,000
Cell B	Facultative; 1.5 acres; 5 feet deep	2,100,000
Cell C	Facultative; 1.5 acres; 5 feet deep	2,100,000
Cell D	Storage; 7.1 acres; 15 feet deep	35,000,000
Total		47,400,000

Summary of Events

Events relevant to this permitting action are summarized below.

1955: wastewater collection and a mechanical wastewater treatment plant were constructed.

1966: the failing mechanical wastewater treatment was bypassed; a new three cell, facultative lagoon treatment facility was constructed. Wastewater is disposed into a ditch.

1973: a gas chlorination facility and transfer structures were added to the lagoons; the main lift station was rebuilt.

1981: a Facility Planning Study summarizes the existing treatment facility as overloaded and improperly functioning, and recommends an aerated lagoon system.

1982: facility upgrades included addition of an aeration system and baffle curtains to the Cell A; Cells B and C remain facultative lagoons. The facility employs year round land application with sprinkler systems and flood irrigation. Facility design is 0.50 MGD.

1991: Initial permit application is submitted.

1992: Initial Wastewater Land Application Permit is issued. Permitted to land apply 40 MGY to 58 acres.

1997: Permit expiration.

2004: DEQ project Nos. 04-01-12 and 04-02-12. Improvements to the facility include addition of a water supply well, construction of the lined 35 MG storage lagoon (Cell 4), an effluent pump station (lifts wastewater from Cells A and C to the new storage lagoon), a storage pump station (pumps stored wastewater to the rotoscreen and chlorine contact chamber), a rotoscreen (treated water is screened prior to chlorination), modifications to the chlorine contact chamber to accept the rotoscreen, a new control building with a tablet feed chlorination system, and installation of an irrigation pump with flow meter. Inter-cell transfer stations were rehabilitated

Cells A, B, and C had sludge removed, dike rehabilitation, and received synthetic lining. Cell A had the baffle curtain and aerator system replaced.

The land application fields received 5 monitoring wells, smoothing and shaping of the irrigation areas, and construction of 3 pivot irrigation systems.

Improvements to the city wastewater collection system include replacement or rehabilitation of existing collection lines; pump station reconstruction with influent flow meter, new pumps, and an emergency generator.

2006: Permit renewal application is submitted. Request 41 MGY to 65.5 acres.

3.0 Site Characterization

3.1 Climate

Arco is 5305 feet in altitude, and receives 9.64 inches of average annual precipitation (Western Regional Climate Center, 1997). The average growing season is 146 days; total annual evaporation is approximately 30 inches.

3.2 Soils

The facility lies on an alluvial plain of the Big Lost River, characterized by deep alluvial deposits of sand and gravel underlain by sedimentary rock. According to test pits, the irrigation area has well graded gravel occurring at depths of 40 inches to 80 inches. The soils in the area have been artificially drained by the impoundment or diversion of water.

The land application area consists of predominately Mooretown-Borco complex soils, with Mooretown-Borah in a small section in the southwest part of the facility. Mooretown-Borco soils are somewhat excessively drained and have slow runoff; permeability is moderate in the upper part and very rapid in the lower part. Borah soils are poorly drained with slow runoff; permeability is moderate in the upper part and very rapid in the lower part.

A permeability analysis just south of the lagoons was conducted in 2003; results were 2.10 and 2.61 inches per hour.

3.3 Ground water

The upper aquifer ranges from 0 to 170 feet and flows in the direction of the Big Lost River – northwest to southeast. Clay lenses create a series of shallow aquifers. First water is usually 30 to 60 feet deep; high ground water associated with spring runoff ranges from 15 to 20 feet deep.

Ground water depth was reported in October of 2006 as 10 feet below ground surface at all six monitoring wells.

Transmissivity at the facility is unknown.

3.4 Surface Water Considerations

There is no surface water within ¼ mile of the facility. The nearest surface water is the Big Lost River which passes within 0.5 miles west of the site.

The facility lies outside of the 100 year flood plain.

4.0 Historic and Proposed Site Loading, Projected Environmental Impacts, and Related Permit recommendations

4.1 Wastewater Quality and Flow

The Arco wastewater treatment facility has a design influent flow of 0.2 million gallons (MG) per day, sufficient to meet demands of year 2025 projected inflow. Metered influent flow data is non existent for the facility.

The lagoon system is designed to achieve 85% reduction of 200 mg/L BOD and 200 mg/L suspended solids influent.

Influent quality data exists only for a single sampling event 1984:

- pH = 7.6; DO = 6; TSS = 316; BOD = 301.

4.2 Hydraulic Loading

4.2.1 NGS Hydraulic Loading

Non growing season wastewater application is prohibited at the facility.

4.2.2 GS Hydraulic Loading

The facility is currently permitted to land apply 40 million gallons of wastewater per year to 65.5 acres, which equates to 22 acre-inches per acre per year (ac*in./ac*yr). The facility plans to add a supplemental irrigation well in the future, though no date has been specified.

Hydraulic application data is available for the years 1996, 1997, and 2006 only. Application volumes reported for those years were 21.8 MG, 61.1 MG, and 36.4 MG, respectively.

Lack of historic data, as well as wide variations in future effluent demand estimates, necessitates the facility to initiate a determined monitoring and reporting program. The facility consultant and the DEQ should review and record annual reports and background records, then estimate the facility's timeline for irrigation acreage expansion.

Table 4.1 Wastewater Loading Rates at Arco

Parameter	**Wastewater Loading**	
	Recommended/**Permit Limit**	Irrigated Actual*
Wastewater loading rate	**40 MG to 65.5 acres**	36.38 MG; 20.5 in./ac*yr
Nitrogen	**150% of crop uptake**.	0.32 to 0.45 lb/ac*yr.
COD	**50 lb/ac*d**	6.2 lb/ac*d
Phosphorus	< 125% of crop uptake	unknown

**Irrigated Actual* values are based on the 2006 Annual Report only. Per HMU values range from 18 to 24 in./ac.

Table 4.2 Crop Irrigation Requirements

Crop	**Irrigation Requirements**	
	(inches/yr)	(million gallons/yr)
Grain	13.8	24.79
Alfalfa	18.9	33.95
Alfalfa/grass mix	34.0	61.08

4.3 Wastewater Constituent Loading

Constituent loadings are listed in Table 4.1, above.

5.0 Site Management and related permit recommendations

5.1 Buffer Zones and Disinfection Level

The facility reports the following buffer zones:

1. Zero feet between the fenced 116 acre facility and areas accessible to the public (via US highway 20/26 and county roads).
2. Property northwest corner: 350 feet from the from the pivot irrigation edge to a commercial area with buildings.
3. Property southwest corner: 350 feet from the pivot irrigation edge to country store; 300 feet to a private well.
4. Property southeast corner: 325 feet to a private residence with well.
5. Property east side: private residence with well at 230 feet from the pivot irrigation edge. The pivot is programmed to shut off the outer nozzles as it passes this area, maintaining a 300 foot buffer distance.
6. greater than ¼ mile (1320 feet) to any:
    - surface water;
    - springs; and,
    - wetlands.
7. There is a public water supply well located 4,000 feet north-northwest of the facility; a future planned public well will be located 1400 feet northeast of the facility.

Given the above conditions, rules dictate disinfection to a minimum level of 23 coliform bacteria organisms per 100 mL (Class C effluent and buffer zone scenario G). The disinfection level is determined in this case by the distance to inhabited buildings as well as areas accessible to the public.

The Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater recommends Scenario G install a three wire pasture fence around the land application unit, posted in each corner and every 500 feet along the perimeter with “Sewage Effluent Application – Keep Out”. The Arco facility is both posted and surrounded with a chain link fence.

5.2 Runoff Control

The Arco facility is completely bermed to prevent runoff from any site or fields used for wastewater reuse to property not owned by the city of Arco, except in the event of a 25-year, 24-hour storm event or greater, using Western Regional Climate Center (WRCC) Precipitation Frequency Map, Figure 28 'Isopluvials of 25-YR, 24-HR Precipitation'. For this site, the 25-year, 24-hour event is 2.2 inches ($^{22}/_{10}$ in.).

It is recommended the facility incorporate a runoff control plan into the Plan of Operation, including a schedule stating frequencies and tasks designed to maintain the runoff control features at the facility, i.e.- berm inspection, berm repair, etc.

5.3 Crop Management

The Arco facility utilizes three crops: grain, alfalfa, and alfalfa and grass mix, necessitating 13.8, 18.9, and 34.0 inches per acre irrigation, respectively. The facility plans to rotate crops.

5.4 Odor Management Plan (Nuisance Odor Plan)

Although odor management is briefly discussed in chapters six and thirteen of the O&M Plan, the procedures should be more extensively reviewed and extracted to stand alone as a separate document and chapter of the *Plan*. See Section 6.2 *Required Activities.*

5.5 Grazing Plan

The Arco facility disinfects to Class C effluent. Grazing is discouraged on municipal wastewater applied sites, but is allowed if it follows a DEQ approved grazing plan. Arco does not have an approved grazing plan; therefore, no grazing is allowed at the facility.

5.6 Waste Solids (Sludge) Management Plan

Due to lagoon repair conducted in 2004, Arco has established procedures for sludge management. The procedures should indicate how the requirements of Permit Condition I.5 are met, and be incorporated into a revised Plan of Operation.

5.7 Buffer Zones and Wellhead Protection

Buffer zones are greater than those recommended in DEQ guidance for Class C effluent (less than 23 coliform organisms per 100 mL).

5.8 Lagoons: Integrity, Sludge Depths, and Seepage Tests

Sludge depth monitoring and action depths should be part of the Waste Solids (Sludge) Management Plan required with this permit renewal.

The DEQ requires all lagoons to be seepage tested every five years to determine liner integrity and meet IDAPA 58.01.16.493. To document compliance with IDAPA 58.01.493 et seq. in the Wastewater Rules, seepage test results should be included with the permit renewal package at that time.

6.0 Status of current activities & recommended activities for the new permit

6.1 Current Activities

The following activities were required by the previous facility permit.

The facility was required to submit a land use contract with the owner of the land application area. The city of Arco has purchased the land application site since the last permit was issued.

IDAPA 58.01.16.202 *Classification of Public Wastewater Systems* requires that all systems be classified. Further, IDAPA 580.01.16.203 *Public Wastewater System Operator Licensure Requirements* requires that each system be under the responsible charge of an operator who holds a valid license equal to or greater than the classification of the system.

The Arco wastewater reuse facility is a Class1 wastewater treatment and a Class 1 wastewater collection facility. Operator Winston Dyer holds Class 1 treatment and a Class 1 collection licenses, but not a land application operator license. The facility backup operator recently left employment with the city of Arco; the replacement backup operator is in the process of licensure.

6.2 Required Activities

Renewed Permit Section E – *Compliance Schedule for Required Activities* prescribes compliance activities to be completed by the facility, and their respective completion deadlines. The compliance activities are described below, according to the compliance activity number.

CA-029-01: Submit a **Plan of Operation** manual update. The current Plan of Operation (*Plan*), also known as the O&M Manual, was written in 1983. The facility has been rebuilt since 1983, and therefore requires an update to the *Plan.* A *Plan of Operation Checklist* is located in the DEQ Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater, Appendix A12, page A-85. A useful Plan would include irrigation schedules, the Odor Management Plan, the Waste Solids Management Plan, and current grazing prohibitions.

The Plan should also include a runoff control plan, complete with a schedule for inspecting and maintaining the existing runoff control devices at the facility. The schedule would include items such as the frequency and dates of berm inspection, berm maintenance, and other activities necessary to maintain runoff control.

CA-029-02: The DEQ requires an **Odor Management Plan** so facilities have a reference on hand for avoiding and addressing odors. Odor Management Plans include wastewater treatment systems, reuse facilities, and other operations associated with the facility, and incorporate specific design considerations, operation and maintenance procedures, and management practices to be employed to minimize odors. Plans also include procedures to respond to an odor incident if one occurs, including notification procedures.

CA-029-03: current DEQ rules require **Seepage Tests** on all lagoons every five years, conducted according to the most recent DEQ procedures.

CA-029-04: a **Waste Solids Management Plan** describes how waste solids generated at the facility will be handled and disposed of to meet the requirements of Permit Section I, No. 5. Waste solids have the potential to contaminate waters of the state, as well as create health hazards and nuisance conditions. The permittee's Waste Solids Management Plan is required in order to minimize the potential negative impacts of waste solids handling.

CA-029-05: It is recommended that a qualified professional review and revise the facility's **irrigation schedules.** The revised irrigation schedule can then be incorporated into the Plan of Operation.

Permit Section G – Monitoring Requirements

Permit Section G contains monitoring requirements for the facility. See Permit Section G for exact descriptions of monitoring and calculations required.

Table 7.1 below is a monitoring schedule for the Permit Section G monitoring requirements. Note that calculation requirements listed in the Permit Section G *Facility Monitoring Table* are not listed in Table 7.1 – only monitoring requirements are listed.

Table 7.1: Monitoring Requirements by Medium

Medium	Daily	Weekly	Monthly	Annually	Other Frequencies
Wastewater – lagoon effluent	Volume to each HMU	Total Coliform	Grab sample	Flow meter calibration	
Supplemental irrigation water	Volume to each HMU			1. Flow meter calibration; 2. Backflow testing; 3. Grab sample.	
Ground water				Grab sample & lab analysis.	
Soil				Lab analysis	First year of permit lab analysis
Fertilizer				Quantity applied	
Crop					Each harvest: crop data, tissue analyses and calculations.

Permit Section H – Standard Reporting Requirements

Permit Section H lists the facility reporting requirements. Table 7.2 summarizes the Annual Report requirements which are derived from monitoring.

Table 7.2 Annual Report Requirements Generated by Monitoring Requirements

MEDIUM	ANNUAL REPORT REQUIREMENTS				
	Monitoring Frequency				
	Daily	Weekly	Monthly	Annually	Other frequencies
Wastewater – lagoon effluent	1. Volume to each HMU in gal/month, gal/yr and in in./ac*month, and in./ac*yr. *2. Calculations (per HMU)*: - nitrogen and phosphorus applied in lb/ac*yr.	Coliform analysis results	Grab sample lab analysis results	Flow meter calibration date and results.	
Supplemental irrigation water	1. Volume to each HMU in gal/month, gal/yr and in in./ac*month, and in./ac*yr.			1. Flow meter calibration date and results; 2. Backflow testing date and results; 3. Lab analysis results.	
Ground water				Grab sample lab results.	
Soil				Lab analysis results	Permit first and last year lab analysis results.
Fertilizer				1. Total pounds applied. 2. *Calculations:* - nitrogen and phosphorus applied in lb/ac*yr.	
Crop	1. *Per harvest monitoring* shall be reported as facility annual totals, as well as totals for each HMU. a. Facility annual totals: • facility total crop yield; • facility total nitrogen, ash, and phosphorus removal. b. Per HMU totals: • crop name; • total number of cuts (harvests) per year; • crop moisture; • per harvest crop yield in tons/ac or lb/ac (dry basis); • tissue analysis (green) results; • per harvest dry basis nitrogen, ash, and phosphorus removal in lb/ac and total pounds. 2. *Annual monitoring* calculations shall be reported as the volume of irrigation water required for crop growth, in inches/acre and total gallons/HMU for each growing season month.				

Other Annual Report requirements, as stated in the permit, are:

1. The status of compliance activities.
2. An interpretive discussion of monitoring data with particular respect to environmental impacts by the facility. The report should interpret the monitoring data, including the lab analyses, and discuss any environmental impacts revealed by the data.
3. All laboratory reports containing the sample results for Section G *Monitoring Requirements.*

7.0 Conclusions and Recommendations

The DEQ recommends that the Arco conduct the new permit required monitoring and report the required data to evaluate system performance, permit compliance, and guarantee that environmental degradation does not occur at the facility.

8.0 Recommendation for Issuance or Denial of Permit

Staff recommends that the attached Municipal Wastewater Reuse Permit be issued. The permit specifies hydraulic loading limits, and establishes monitoring requirements to adequately protect public health and the environment.

9.0 References

USDA – "Soil Survey of Jefferson County, Idaho", United States Department of Agriculture, Soil Conservation Service, December 1979.